



**Operating Manual**

**hps+ Ultrasonic Sensors**  
**for application in overpressure**  
**with one analogue output and**  
**one switching output**

hps+25/DIU/TC/E/G1  
hps+35/DIU/TC/E/G1  
hps+130/DIU/TC/E/G1  
hps+340/DIU/TC/E/G2  
hps+340/DIU/TC/G2

**Product description**

- The hps+ sensor measures the level in a vessel in up to 6 bar overpressure contactless. The G1 and G2 threaded pipe end permits the mounting and sealing of the sensor in a flange of the vessel. At the analogue output a signal proportional to the level is created and the pnp switching output is set according to the adjusted detect distance.
- The surfaces of the ultrasonic transducers of the hps+ sensors are protected by a PTFE-film and sealed with a FFKM-O-ring against the sensor housing. Therefore the surface of the ultrasonic transducer can be cleaned from cakings or spots.
- The sensor automatically detects the load put to the analogue output and switches to current output or voltage output respectively.

- All settings are done with two push-buttons and a three-digit LED-display (TouchControl).
- Light emitting diodes (three-colour LEDs) indicate all operation conditions.
- Choosing between rising and falling output characteristic as well as output function NOC and NCC is possible.
- The sensors are adjustable manually using the numerical LED-display or may be trained using Teach-in processes.
- Useful additional functions are set in the Add-on-menu.
- Using the LinkControl adapter (optional accessory) all TouchControl and additional sensor parameter settings can be adjusted by a Windows® Software.

**Safety Notes**

- Read the operating instructions prior to start-up.
- Connection, installation and adjustment works may only be carried out by expert personnel.
- No safety component in accordance with the EU Machine Directive, use in the area of personal and machine protection not permitted

**Proper Use**

hps+ ultrasonic sensors are used for non-contact detection of objects.

The hps+ sensors indicate a **blind zone**, in which the distance cannot be measured. The **operating range** indicates the distance of the sensor that can be applied in normal atmospheric pressure with sufficient function reserve.

**Installation**

- ➔ Assemble the sensor at the installation location.
- ➔ If necessary seal the sensor with the enclosed Viton® O-ring (34 x 2,5 mm or 60 x 4 mm) against the flange.
- ➔ Plug in the connector cable to the M 12 connector, see Fig. 1.

|   |                 |               |
|---|-----------------|---------------|
|   |                 | <b>colour</b> |
| 1 | +U <sub>B</sub> | brown         |
| 3 | -U <sub>B</sub> | blue          |
| 4 | D               | black         |
| 2 | I/U             | white         |
| 5 | Sync/Com        | grey          |

Fig. 1: Pin assignment with view onto sensor plug and colour coding of the microsonic connection cable

**Notes**

- In operation in overpressure it is recommended to adjust the sensitivity of the hps+ sensor: choose the parameter A14 in the Add-on menu and set it to sensitivity E2 for atmospheric pressure from 1 to 3 bar or to sensitivity E3 for atmospheric pressure >3 bar.
- hps+ sensors have internal temperature compensation. Because the sensors heat up on their own, the temperature compensation reaches its optimum working point after approx. 30 minutes of operation.
- If an object is within the set window limits of the analogue output, then LED D1 lights up green, if the object is outside the window limits, then LED D1 lights up red.
- The load put to the analogue output is detected automatically when turning supply voltage on.
- During normal operating mode, a yellow LED D2 signals that the switching output has connected.
- During normal operating mode, the measured distance value is displayed on the LED-indicator in mm. Alternatively a percentage scale may be set in the add-on menu. In this connection 0 % and 100 % correspond to the set window limits of the analogue output.
- During Teach-in mode, the hysteresis loops are set back to factory settings.
- If no objects are placed within the detection zone the LED-indicator shows » — — «.
- If no push-buttons are pressed for 20 seconds during parameter setting mode the made changes are stored and the sensor returns to normal operating mode.
- The sensor can be reset to its factory setting, see »Key lock and factory setting«, Diagram 3.

**Start-up**

- ➔ Connect the power supply.
- ➔ Set the parameters of the sensor manually via TouchControl (see Fig. 2 and Diagram 1)
- ➔ or use the Teach-in procedure to adjust the detect points (see Diagram 2).

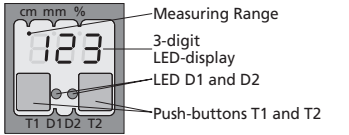


Fig. 2: TouchControl/LED display

**Factory setting**

hps+ sensors are delivered factory made with the following settings:

- Rising analogue characteristic
- Window limits for the analogue output set to blind zone and operating range
- Switching output on NOC
- Detecting distance at operating range
- Measurement range set to maximum range
- Sensitivity at Normal preasure

**Maintenance**

hps+ sensors work maintenance free. Small amounts of dirt on the surface do not influence function. Thick layers of dirt and caked-on dirt affect the sensor function and therefore must be removed.

**Show parameters**

- ➔ In normal operating mode shortly push T1. The LED display shows »PAr.«
- Each time you tap push-button T1 the actual settings of the analogue output are shown.

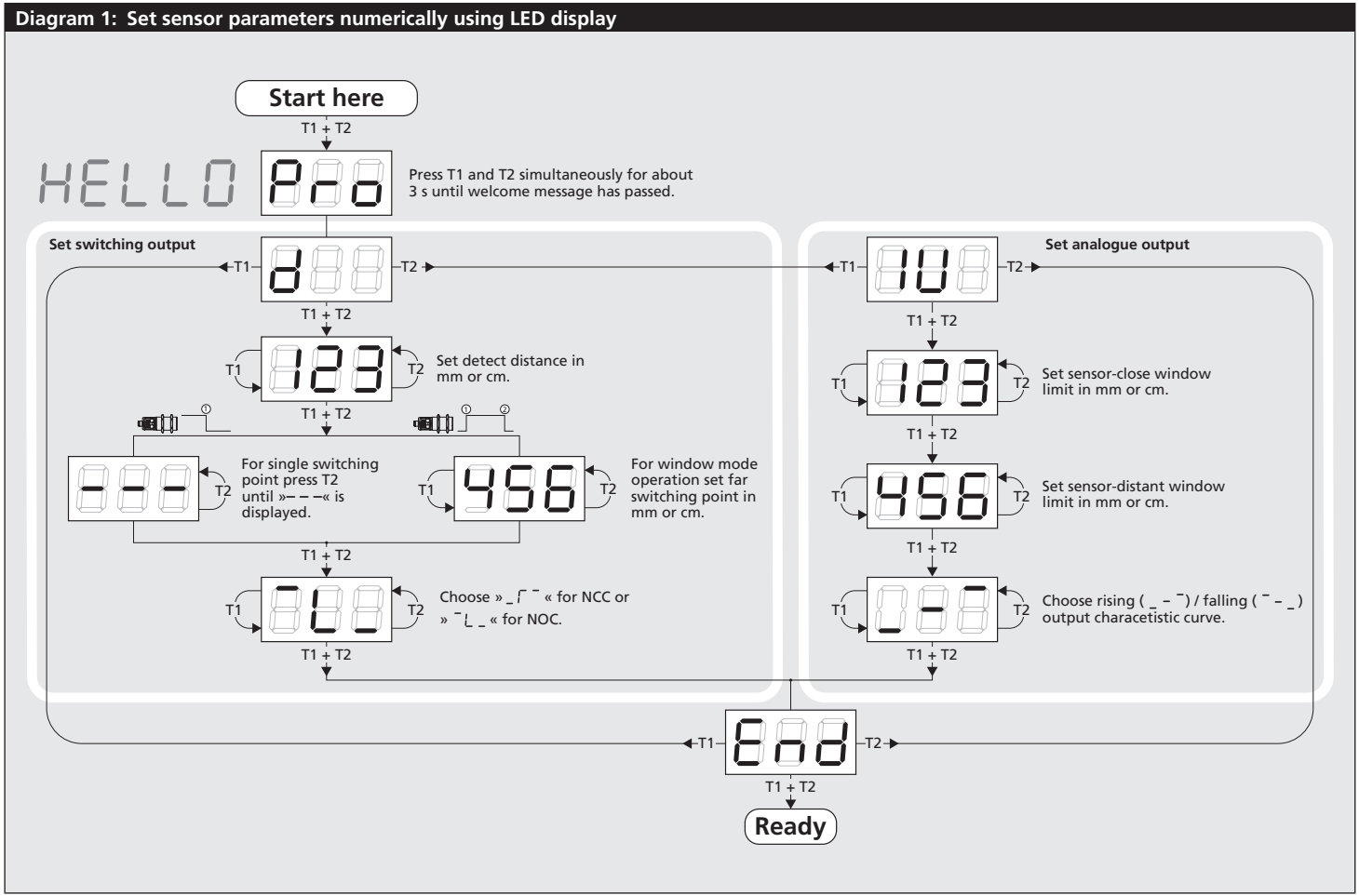
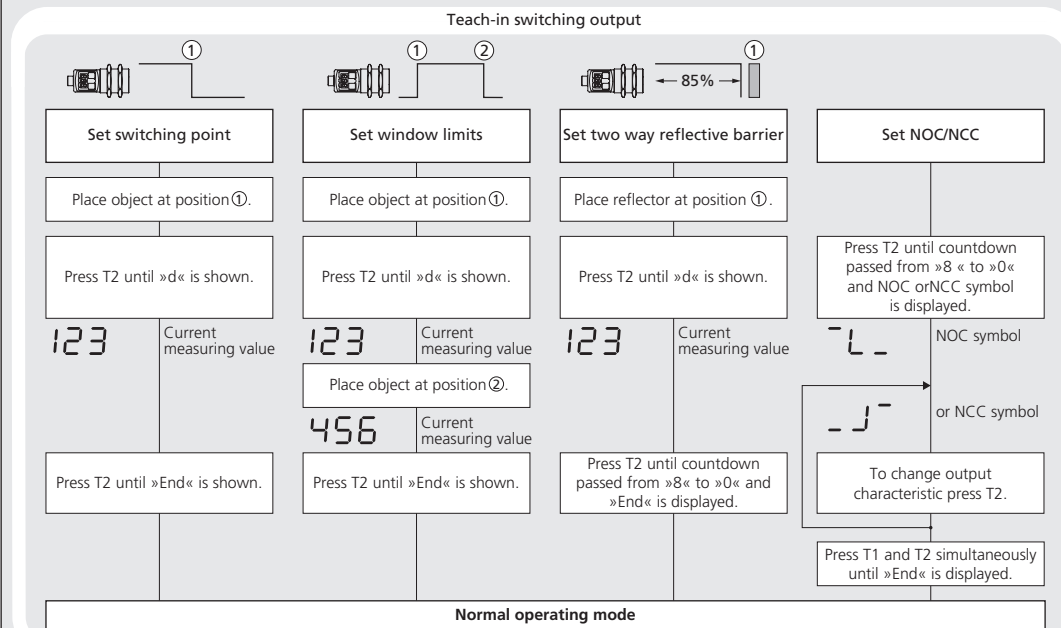


Diagram 2: Set sensor parameters via Teach-in procedure



### Diagram 3: Key lock and factory setting

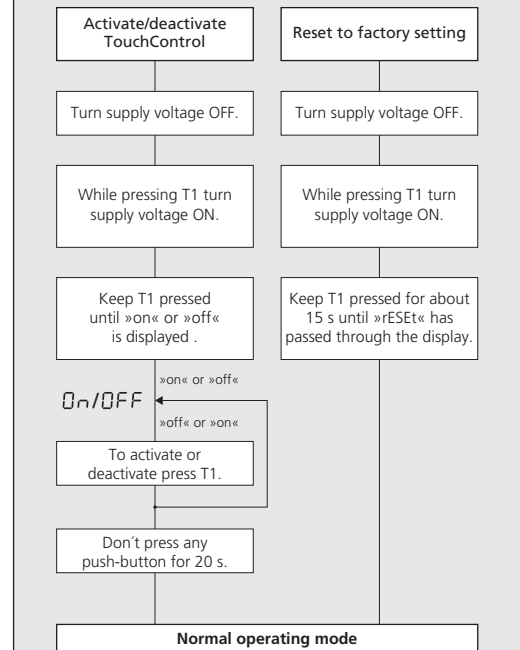
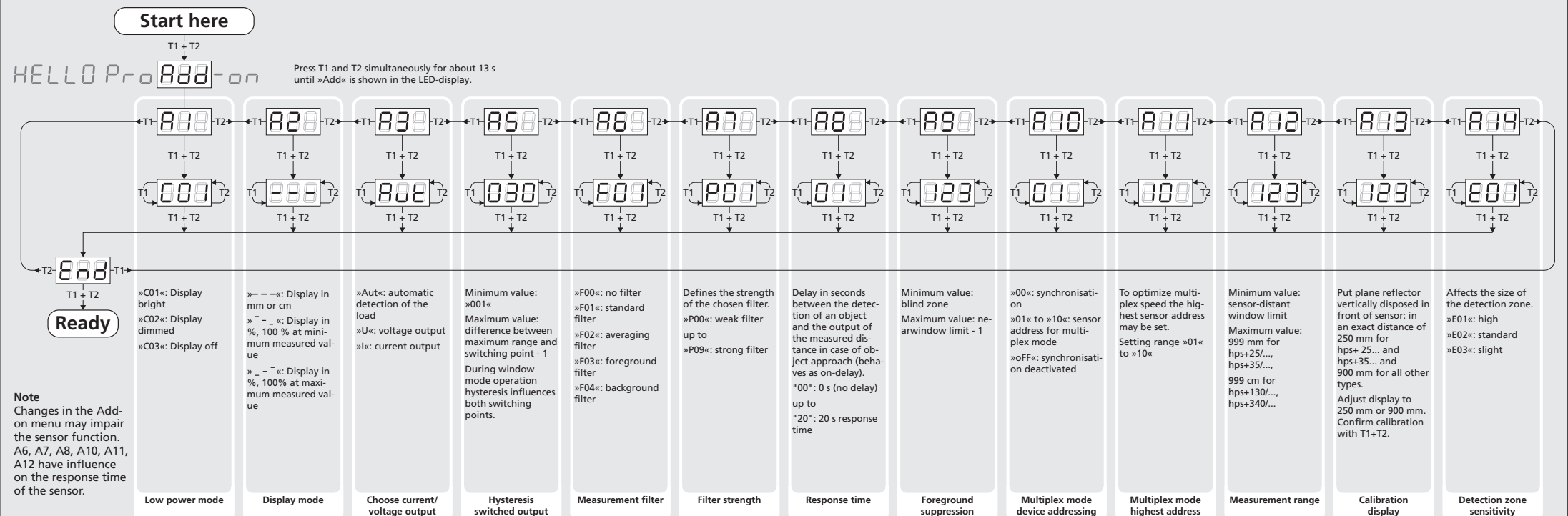
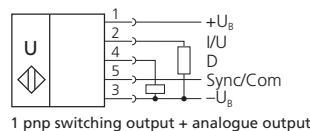


Diagram 4: Useful additional functions in Add-on menu (for experienced users only, settings not required for standard applications)



# Technical data



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | hps+25...                                                                                                                                             | hps+35...                                                                                                                                             | hps+130...                                                                                                                                            | hps+340...                                                                                                                                            | hps+340...                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                       |                                                                                                                                                       |                                                                                                                                                       |                                                                                                                                                       |                                                                                                                                                       |
| <b>Blind zone</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0 to 30 mm                                                                                                                                            | 0 to 85 mm                                                                                                                                            | 0 to 200 mm                                                                                                                                           | 0 to 350 mm                                                                                                                                           | 0 to 350 mm                                                                                                                                           |
| <b>Operating range</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 250 mm                                                                                                                                                | 350 mm                                                                                                                                                | 1,300 mm                                                                                                                                              | 3,400 mm                                                                                                                                              | 3,400 mm                                                                                                                                              |
| <b>Maximum range</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 990 mm                                                                                                                                                | 1,500 mm                                                                                                                                              | 5,000 mm                                                                                                                                              | 8,000 mm                                                                                                                                              | 8,000 mm                                                                                                                                              |
| <b>Angle of beam spread</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | see detection zone                                                                                                                                    | see detection zone                                                                                                                                    | see detection zone                                                                                                                                    | see detection zone                                                                                                                                    | see detection zone                                                                                                                                    |
| <b>Transducer frequency</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 320 kHz                                                                                                                                               | 320 kHz                                                                                                                                               | 180 kHz                                                                                                                                               | 120 kHz                                                                                                                                               | 120 kHz                                                                                                                                               |
| <b>Resolution, sampling rate</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.025 mm                                                                                                                                              | 0.18 mm                                                                                                                                               | 0.18 mm                                                                                                                                               | 0.18 mm                                                                                                                                               | 0.18 mm                                                                                                                                               |
| <b>Reproducibility</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ±0.15 %                                                                                                                                               | ±0.15 %                                                                                                                                               | ±0.15 %                                                                                                                                               | ±0.15 %                                                                                                                                               | ±0.15 %                                                                                                                                               |
| <b>Accuracy</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Temperature drift internal compensated, ≤2 % can be deactivated <sup>1)</sup> (0,17 %/K without compensation)                                         | Temperature drift internal compensated, ≤2 % can be deactivated <sup>1)</sup> (0,17 %/K without compensation)                                         | Temperature drift internal compensated, ≤2 % can be deactivated <sup>1)</sup> (0,17 %/K without compensation)                                         | Temperature drift internal compensated, ≤2 % can be deactivated <sup>1)</sup> (0,17 %/K without compensation)                                         | Temperature drift internal compensated, ≤2 % can be deactivated <sup>1)</sup> (0,17 %/K without compensation)                                         |
| <b>Detection zones</b><br>for different objects:<br>The dark grey areas are determined with a thin round bar and indicate the typical operating range of a sensor. In order to obtain the light grey areas, a plate (500 x 500 mm) is introduced into the beam spread from the side. In doing so, the optimum angle between plate and sensor is always employed. This therefore indicates the maximum detection zone of the sensor. It is not possible to evaluate ultrasonic reflections outside this area.<br>Displayed is the detection zone at standard pressure. At 1 bar overpressure the sensitivity of the sensor will increase 5 times. |                                                                                                                                                       |                                                                                                                                                       |                                                                                                                                                       |                                                                                                                                                       |                                                                                                                                                       |
| <b>Operating voltage U<sub>B</sub></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 9 to 30 V DC, short-circuit-proof                                                                                                                     | 9 to 30 V DC, short-circuit-proof                                                                                                                     | 9 to 30 V DC, short-circuit-proof                                                                                                                     | 9 to 30 V DC, short-circuit-proof                                                                                                                     | 9 to 30 V DC, short-circuit-proof                                                                                                                     |
| <b>Voltage ripple</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ±10 %                                                                                                                                                 | ±10 %                                                                                                                                                 | ±10 %                                                                                                                                                 | ±10 %                                                                                                                                                 | ±10 %                                                                                                                                                 |
| <b>No-load supply current</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ≤ 80 mA                                                                                                                                               | ≤ 80 mA                                                                                                                                               | ≤ 80 mA                                                                                                                                               | ≤ 80 mA                                                                                                                                               | ≤ 80 mA                                                                                                                                               |
| <b>Ambient pressure</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | up to 6.0 bar                                                                                                                                         | up to 6.0 bar                                                                                                                                         | up to 6.0 bar                                                                                                                                         | up to 6.0 bar                                                                                                                                         | up to 6.0 bar                                                                                                                                         |
| <b>Housing</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring                                                        | Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring                                                        | Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring                                                        | Stainless steel 1.4571, plastic parts: PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring                                                        | Plastic parts: PVDF, PBT, TPU; Ultrasonic transducer: PTFE film, FFKM O-ring                                                                          |
| <b>Process connection</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | G1                                                                                                                                                    | G1                                                                                                                                                    | G1                                                                                                                                                    | G2                                                                                                                                                    | G2                                                                                                                                                    |
| <b>Class of protection to EN 60529</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | IP 67                                                                                                                                                 | IP 67                                                                                                                                                 | IP 67                                                                                                                                                 | IP 67                                                                                                                                                 | IP 67                                                                                                                                                 |
| <b>Norm conformity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | EN 60947-5-2                                                                                                                                          | EN 60947-5-2                                                                                                                                          | EN 60947-5-2                                                                                                                                          | EN 60947-5-2                                                                                                                                          | EN 60947-5-2                                                                                                                                          |
| <b>Type of connection</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 5-pin initiator plug, PBT                                                                                                                             | 5-pin initiator plug, PBT                                                                                                                             | 5-pin initiator plug, PBT                                                                                                                             | 5-pin initiator plug, PBT                                                                                                                             | 5-pin initiator plug, PBT                                                                                                                             |
| <b>Controls</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2 push-buttons (TouchControl)                                                                                                                         | 2 push-buttons (TouchControl)                                                                                                                         | 2 push-buttons (TouchControl)                                                                                                                         | 2 push-buttons (TouchControl)                                                                                                                         | 2 push-buttons (TouchControl)                                                                                                                         |
| <b>Indicators</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 3-digit LED-display, 2 three-colour LEDs                                                                                                              | 3-digit LED-display, 2 three-colour LEDs                                                                                                              | 3-digit LED-display, 2 three-colour LEDs                                                                                                              | 3-digit LED-display, 2 three-colour LEDs                                                                                                              | 3-digit LED-display, 2 three-colour LEDs                                                                                                              |
| <b>Programmable</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | with TouchControl and LinkControl                                                                                                                     | with TouchControl and LinkControl                                                                                                                     | with TouchControl and LinkControl                                                                                                                     | with TouchControl and LinkControl                                                                                                                     | with TouchControl and LinkControl                                                                                                                     |
| <b>Operating temperature</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | -25 to +70 °C                                                                                                                                         | -25 to +70 °C                                                                                                                                         | -25 to +70 °C                                                                                                                                         | -25 to +70 °C                                                                                                                                         | -25 to +70 °C                                                                                                                                         |
| <b>Storage temperature</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -40 to +85 °C                                                                                                                                         | -40 to +85 °C                                                                                                                                         | -40 to +85 °C                                                                                                                                         | -40 to +85 °C                                                                                                                                         | -40 to +85 °C                                                                                                                                         |
| <b>Weight</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 210 g                                                                                                                                                 | 210 g                                                                                                                                                 | 210 g                                                                                                                                                 | 1,200 g                                                                                                                                               | 350 g                                                                                                                                                 |
| <b>Switching hysteresis <sup>1)</sup></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3 mm                                                                                                                                                  | 5 mm                                                                                                                                                  | 20 mm                                                                                                                                                 | 50 mm                                                                                                                                                 | 50 mm                                                                                                                                                 |
| <b>switching frequency <sup>1)</sup></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 11 Hz                                                                                                                                                 | 9 Hz                                                                                                                                                  | 5 Hz                                                                                                                                                  | 3 Hz                                                                                                                                                  | 3 Hz                                                                                                                                                  |
| <b>Response time <sup>1)</sup></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 65 ms                                                                                                                                                 | 84 ms                                                                                                                                                 | 160 ms                                                                                                                                                | 240 ms                                                                                                                                                | 240 ms                                                                                                                                                |
| <b>Time delay before availability</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <300 ms                                                                                                                                               | <300 ms                                                                                                                                               | <300 ms                                                                                                                                               | <380 ms                                                                                                                                               | <380 ms                                                                                                                                               |
| <b>Order No.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>hps+25/DIU/TC/E/G1</b>                                                                                                                             | <b>hps+35/DIU/TC/E/G1</b>                                                                                                                             | <b>hps+130/DIU/TC/E/G1</b>                                                                                                                            | <b>hps+340/DIU/TC/E/G2</b>                                                                                                                            | <b>hps+340/DIU/TC/G2</b>                                                                                                                              |
| <b>Switching output</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | pnp, U <sub>B</sub> = 2 V, I <sub>max</sub> = 200 mA                                                                                                  | pnp, U <sub>B</sub> = 2 V, I <sub>max</sub> = 200 mA                                                                                                  | pnp, U <sub>B</sub> = 2 V, I <sub>max</sub> = 200 mA                                                                                                  | pnp, U <sub>B</sub> = 2 V, I <sub>max</sub> = 200 mA                                                                                                  | pnp, U <sub>B</sub> = 2 V, I <sub>max</sub> = 200 mA                                                                                                  |
| <b>Current output 4 to 20 mA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | switchable NOC/NCC, short-circuit-proof<br>R <sub>L</sub> ≤ 100 Ω at 9 V ≤ U <sub>B</sub> ≤ 20 V;<br>R <sub>L</sub> ≤ 500 Ω at U <sub>B</sub> ≥ 20 V  | switchable NOC/NCC, short-circuit-proof<br>R <sub>L</sub> ≤ 100 Ω at 9 V ≤ U <sub>B</sub> ≤ 20 V;<br>R <sub>L</sub> ≤ 500 Ω at U <sub>B</sub> ≥ 20 V  | switchable NOC/NCC, short-circuit-proof<br>R <sub>L</sub> ≤ 100 Ω at 9 V ≤ U <sub>B</sub> ≤ 20 V;<br>R <sub>L</sub> ≤ 500 Ω at U <sub>B</sub> ≥ 20 V  | switchable NOC/NCC, short-circuit-proof<br>R <sub>L</sub> ≤ 100 Ω at 9 V ≤ U <sub>B</sub> ≤ 20 V;<br>R <sub>L</sub> ≤ 500 Ω at U <sub>B</sub> ≥ 20 V  | switchable NOC/NCC, short-circuit-proof<br>R <sub>L</sub> ≤ 100 Ω at 9 V ≤ U <sub>B</sub> ≤ 20 V;<br>R <sub>L</sub> ≤ 500 Ω at U <sub>B</sub> ≥ 20 V  |
| <b>Voltage output 0 to 10 V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Rising/falling output characteristic<br>R <sub>L</sub> ≥ 100 kΩ at U <sub>B</sub> ≥ 15 V, short-circuit-proof<br>Rising/falling output characteristic | Rising/falling output characteristic<br>R <sub>L</sub> ≥ 100 kΩ at U <sub>B</sub> ≥ 15 V, short-circuit-proof<br>Rising/falling output characteristic | Rising/falling output characteristic<br>R <sub>L</sub> ≥ 100 kΩ at U <sub>B</sub> ≥ 15 V, short-circuit-proof<br>Rising/falling output characteristic | Rising/falling output characteristic<br>R <sub>L</sub> ≥ 100 kΩ at U <sub>B</sub> ≥ 15 V, short-circuit-proof<br>Rising/falling output characteristic | Rising/falling output characteristic<br>R <sub>L</sub> ≥ 100 kΩ at U <sub>B</sub> ≥ 15 V, short-circuit-proof<br>Rising/falling output characteristic |

<sup>1)</sup> Can be programmed via TouchControl and LinkControl.